DIVISION 275313 ANALOG SYNCHRONOUS CLOCKS

Record Version 20140609

Part 1 - General

1.1 Work Included

A. Provide all labor, materials, tools and equipment required for the complete installation of work called for on the Construction Drawings and described in the Specifying Documentation.

1.2 Related Work in Other Sections

A. All raceway systems including but not limited to conduit, j-boxes, outlet boxes, & raceway shall be furnished and installed by Division 260000 contractor.

B. Integration with existing or new public address Division 277000 contractor, school intercom system for synchronized bells with clocks.

1.3 Scope of Work

A. This document describes the products and execution requirements relating to furnishing and installing Analog Synchronous Clocks. Clock Electronics and installation requirements are covered under this document.

B. The intent of these Specifications is to provide a complete Analog Synchronous Clock System and it is the responsibility of the bidding Contractor to provide a complete solution. It is also the responsibility of the Contractor to provide all material necessary to provide a complete system even if the material is not described specifically in the following documentation. All questions concerning non specified product and services will be address to the Owner's Representative before the Contactor provides a bid. Owner expects that by accepting the Contractor's bid proposal that they [the Contractor] have provided a competent bid for a complete solution.

C. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of devices, typical installation details, and mounting details will be provided as an attachment to this document. The successful vendor shall meet or exceed all requirements for the cable system described in this document.

1.4 Approvals

A. The system shall maintain the following listings and/or approvals from the following agencies:

1. (UL) Underwriter's Laboratories
2. FCC Federal Communications Commission

1.5 Regulatory References

A. The following industry standards are the basis for the structured cabling system described in this document.

1. California Electrical Code 2010
2. NFPA – National Fire Protection Association
   - NFPA 70 National Electric Code(NEC)
3. ADA – Americans with Disabilities Act
4. ASCII - American Standard Code for information Interchange
5. ASTM - American Society for Testing and Materials

B. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to the most recent release when developing the proposal for installation.

C. This document does not replace any code, either partially or wholly. The contractor must be aware of local codes that may impact this project. If these documents conflict with local

code it is the Contractor's responsibility to inform the Owner and the Owners Representative in writing before the set Bid Date.

1.6 Contractor Qualifications/Quality Assurance

A. Safety and Indemnity
   1. Contractors will submit the necessary documentation to demonstrate their compliance with Section 270000 "1.5 A. Safety & Indemnity".

B. Contractor Qualifications
   1. Contractors will submit the necessary documentation to demonstrate their compliance with Section 270000 "1.5 B. Contractor Qualification".

C. Quality Assurance
   1. Contractor shall comply with all requirements as specified in Section 270000 "1.5 C. Quality Assurance".

D. Warranty
   1. Contractor shall comply with all requirements as specified in Section 270000 "1.8. Acceptance & Warranties".

1.7 Submittal Documentation

A. The successful contractor shall provide their submittal package in accordance with the Section 01 20 00 1.06 Submittal Schedule, and Section 270000 "1.6 Submittal Documentation".

1.8 Equivalent Products

A. All products approved in this specification are those of:
   1. Sapling, Inc.
   2. American Time & Signal or EQUAL

B. Contractors wishing to approve a system other than those specified in this document shall do so in accordance with Section 270000 ":1.7 Equivalent Products".

Part 2 - System Description

2.1 Wireless analog and/or digital clock system with interface capability to GPS, network, internet and existing systems such as: 58 minute, 59 minute, National Time & Rauland sync-wire, once a day reset, 2-wire digital communication and RS485 communication.

2.2 The system can work as a standalone system or in conjunction with an existing wired system and the system shall have interface capability to GPS, network, Internet and existing systems such as: 58 minute, 59 minute, National Time & Rauland sync-wire, once a day reset, 2-wire digital communication and RS485 communication.

2.3 The system shall be designed to work in an environment where cabling options are not available. The system shall be capable of working in 915-928 MHz frequency-hopping technology. The system shall be capable of automatic transmission of data along 51 alternating frequencies that allows for an enhanced signal, even if there is interference in one of the frequencies.

2.4 Each clock in the system shall be capable of receiving and transmitting the wireless signal which allows it to be used as a repeater while boosting the data stream and sending along the system. With this dual capability there shall be no limit on the number of clocks that can be used in the installation. The clock shall be designed to automatically work together without interference with each other. The system shall be capable of increasing the quality of the signal while increasing the quantity of the clocks.

2.5 The analog clocks shall be capable of working in one (1) of the following options:

2.6 Two (2) D cell batteries; the clock receives and transmits time every two (2) or four (4) hours, as selected by the user.

2.7 110 volts AC; the clock receives and transmits time every one (1) minute.

2.8 24 volts AC/DC; the clock receives and transmits time every one (1) minute.

2.9 The digital clocks shall be capable of working in one (1) of the following options:

2.10 110 volts AC; the clock receives and transmits time every one (1) minute.

2.11 24 volts AC/DC; the clock receives and transmits time every one (1) minute.

2.12 The elapsed timer shall be capable of working in conjunction with either the four (4) digit or six (6) digit digital clocks and shall have the ability to count down or count up.

2.13 The analog and the digital clock shall include automatic digital calibration for time base to minimize deviation from each other.

2.14 The analog clock shall have a built-in close-loop system that will allow the clock to detect the position of the hands and bring the clock to the right time even if the clock were manually or forcefully altered.

2.15 The analog clock shall have the capability for diagnostic function that will allow the user to view the quality of the signal, how long since the last time the clock received a signal, as well as functional tests of the electronics and the gears.

2.16 The system shall operate in a license-free frequency range where no license is required.

2.17 Analog Synchronous Clocks

A. Correct for minute- and second-hand synchronization at least once each hour and for hour-hand synchronization at least once each day.

B. Radio Controlled clocks are equipped with miniaturized radio receivers to receive the time signal transmitted by the National Institute of Standards and Technology (NIST) from Fort Collins, Colorado.

C. The time signal is based on the cesium clock, the most accurate timekeeping device in the world.

D. The clock will automatically receive and compare the time signal with the time shown on the clock.

E. In case of a deviation, the clock will automatically correct its time to agree with the time signal. This procedure is executed several times a day to keep the clock on time.

Part 3 - **Products**

The following sections specifically list the acceptable equipment types and items for this project. Where quantities are not noted, they may be obtained from the project drawings. In the event of a discrepancy between the specifications and the project drawings, the greater quantity or better quality shall be furnished.

3.1 Analog Clocks

A. Master Clock/Transceiver/Transmitter - There are two versions of master clocks/ transmitters that can be selected.

1. SMA 3000 Master Clock/Transceiver/Transmitter:

2. The Master Clock / Transmitter shall be the Sapling SMA 3000 Series. The master clock shall have a LED display, as well as a backlit, two row by twenty character LCD display. The transmitter shall be capable of transmitting data to the SAL wireless analog clock and the SBL wireless digital clock. The master clock shall be capable of receiving a signal from any SNTP time server via the Internet. The master clock shall have up to ten pre-programmed SNTP servers to use in case the clock does not receive time from one of the servers via a web interface. The transmitter will be capable of receiving signals from all Sapling Master Clocks via RS485, as well as 59 minute correction, 58 minute correction, National Time and Rauland, and Dukane. The transmitter shall have the capability of transferring a wired system into a wireless system. The transmitter shall contain two clock circuits that have the capability to run synchronous wire systems such as 59 minute correction, 58 minute correction, National Time/Rauland or a once a day pulse for intercom systems. The transmitter shall be capable of acting as a repeater while receiving a signal wired or wirelessly from the main transmitter. The master clock shall be programmed via the 16 button rubber tactile keypad. The transmitter shall

be capable of interfacing with the SAM Series analog clock via the Converter Box, and the SRM Series analog clock and SBD 1000 digital clock via RS485. The transmitter shall utilize 915–928 MHz frequency–hopping technology. The master clock shall be powered by 110VAC/60 Hz or 220VAC/50 Hz. The transmitter is pending FCC approval.

a. SMA 3000 upgrade options (provided by contractor with base bid):

1) Optional Relays (zones) - The master clock shall be capable of utilizing four or eight zones that can be used for bell scheduling, lights, etc. The zones shall be capable of being programmed via the 16 button rubber tactile keypad and LCD display.
2) GPS – The master clock shall have the option of having a GPS receiver built into the unit for synchronization from the satellites via UTC.
3) Web Interface – The master clock shall be able to be programmed completely from a web interface that can be accessed through any typical web browser such as Microsoft Internet Explorer or Mozilla FireFox. The interface shall allow the user to program all bell schedules, events, display features, IP settings of the master clock and any system setting that the master clock has.
4) SNTP Server – The master clock shall have the capability to act as a SNTP server that other devices can point to in order to receive the time through SNTP protocol.
5) Countdown for Digital Clocks – The master clock shall be able to set the countdown time between events and have the digital clocks count down.

B. Repeaters – There are two types of repeaters that are available for the wireless system. Please select the repeater based on the information below.

1. SMA 1000 Wireless Repeater

1. The repeater shall be a Sapling Wireless Repeater. The repeater shall wirelessly transmit and receive data. The repeater shall be capable of transmitting to the SAL wireless analog clock and the SBL wireless digital clock. The repeater shall work on 915–928 MHz frequency–hopping technology. The repeater shall wirelessly transmit and receive data. The repeater is to have a maximum antenna size of seven (7) inches. The repeater shall have an RF input sensitivity of –103 dbm. The repeater is to have a RF power output of 27 dbm. The voltage input for the repeater shall be 110 volts/60 Hz or 220 volts/50 Hz. The repeater is pending FCC approval.

C. SMA 1000 Network Repeater

1. The repeater shall be a Sapling Network Repeater. The repeater shall receive its time via TCP/IP from the main SMA 2000 or 3000 master clock in the application. The repeater shall be capable of transmitting to the SAL wireless analog clock and the SBL wireless digital clock. The repeater shall work on 915–928 MHz frequency–hopping technology. The repeater shall wirelessly transmit and receive data. The repeater is to have a maximum antenna size of seven (7) inches. The repeater shall have an RF input sensitivity of –103 dbm. The repeater is to have a RF power output of 27 dbm. The voltage input for the repeater shall be 110 volts/60 Hz or 220 volts/50 Hz. The repeater is pending FCC approval.

D. Analog Clock:

1. The secondary clock shall be Sapling SAL Series wireless clock. The clock will be capable of receiving a signal from multiple clocks. The clock shall receive and transmit with 915–928 MHz frequency–hopping technology.

The clock is to be capable of transmitting the time simultaneously without interfering with each other. The clocks shall include automatic calibration, as well as a diagnostic function that allows the user to view the quality of the signal, the last time the clock received a correction signal, a gearbox test and a comprehensive analysis of the entire clock. The clock shall have a maximum correction time of five (5) minutes. It shall be designed to be used with the Sapling Transceiver or the Sapling Repeater, which can be regulated via Sapling wireless communication protocol. Upon receipt of the wireless signal, the clock will immediately self–correct. The clock shall have a semi–flush smooth surface ABS case. The dial is to be made of durable polystyrene material. The crystal is to be shatterproof, side molded polycarbonate. Glass and visible molding marks are unacceptable. The clock shall have black hour and minute hands as well as a red second hand. The clock shall be FCC compliant, part 15 Section 15,247.

** Contractor will provide TWO AA batteries for each clock.*

E. Wire Guards
   1. The approved Wire Guard shall have:
      - Bright zinc plated
      - Epoxy lacquer clear coat
      - Constructed with heavy gauge wire
      - Convenient mounting tabs applied
      - 15-3/4" diameter x 4" deep
      - The Wire Gaurd shall be a **American Time & Signal G2079**.

** Contractor will provide wire guards for all clocks with "WG" noted.*

Part 4 - Execution

4.1 General

A. All Work described in this specifying document and on the Project drawings shall be performed in accordance with the acknowledged Professional and Industry standards and practices. All installed equipment shall meet and/or exceed the specified manufactures regulations.

B. The Contractor shall maintain a competent supervisor and Manufacture Certified Technician assigned to this installation for the duration of the Project.

C. Furnish and install all materials, devices, components and equipment required for a complete and operational system.

D. It is the contractor's obligation to inform the Owner and/or the Owner's Representative of any and all conflict's, between the project documents and the onsite conditions.

E. It is the Contractor's responsibility and obligation to coordinate with all necessary trades to ensure the integrity and compliance of the Manufacture and Industry standards are meet during the duration of the installation.

4.2 Installation

A. Furnish components, materials, parts, equipment, labor, etc. necessary for the complete installation of the systems in full accordance with the recommendations of the equipment manufacturers and the requirements of the drawings and specifications.

B. Equipment shall be held firmly in place with proper types of mounting hardware. All equipment affixed to the building structure must be self-supporting with a safety factor of at least three. All equipment shall be installed so as to provide reasonable safety to the operator. Supply adequate ventilation for all enclosed equipment items which produce heat.

C. Clocks shall not be installed until painting and other finish work in each room is complete.

D. For battery clocks, insert the two "AA" cell batteries. The receiver will search for a signal from the transmitter by scanning all frequencies. Upon receipt of the signal, the clock will store the frequency in memory and set the clock to the exact second of the transmitter. The clocks will locate the position of the hands and automatically set them to be in perfect

synchronization to the Master Transmitter. The clock hands will move in a quick “clockwise” motion until they get to the transmitter time.

4.3 Programming

A. All clocks shall be adjusted to local time, prior to acceptance. Clocks that do not sync to the NIST shall be replaced.

4.4 Training

A. Contractor shall provide no less than three (2) two (1) hour training sessions.
   1. The first training session will be a “Train the Trainer”. The owner will appoint their representative to be provided extensive training so that he/she will be able to provide additional support once the project has been completed.
   2. The additional training session will be provided as a general overview of the system operation for large groups or several smaller groups as designated by the owner. Usually these additional training events will coincide with a school function when the sound system will be used.
   3. Provide sign in sheets for all training events. Deliver to architect in the close out documents.

4.5 Warranty

A. Contractor will provide a minimum of a 1 year Workmanship Warranty that includes Parts and Labor.

B. All equipment provided under this specification shall be warranted to be free from defects in materials and workmanship for a period of 12 months from the notice of completion.

4.6 System Documentation

A. Upon completion of the installation, the contractor shall provide four copies (one hardcopy and three electronic copies) of Project Close-Out Documents to the Owner. Documentation shall include the items detailed in the sub-sections below:
   1. Maintenance and Operation Manuals
   2. As-Built Drawings

B. The **As-Built** drawings are to include device locations.

END OF SECTION